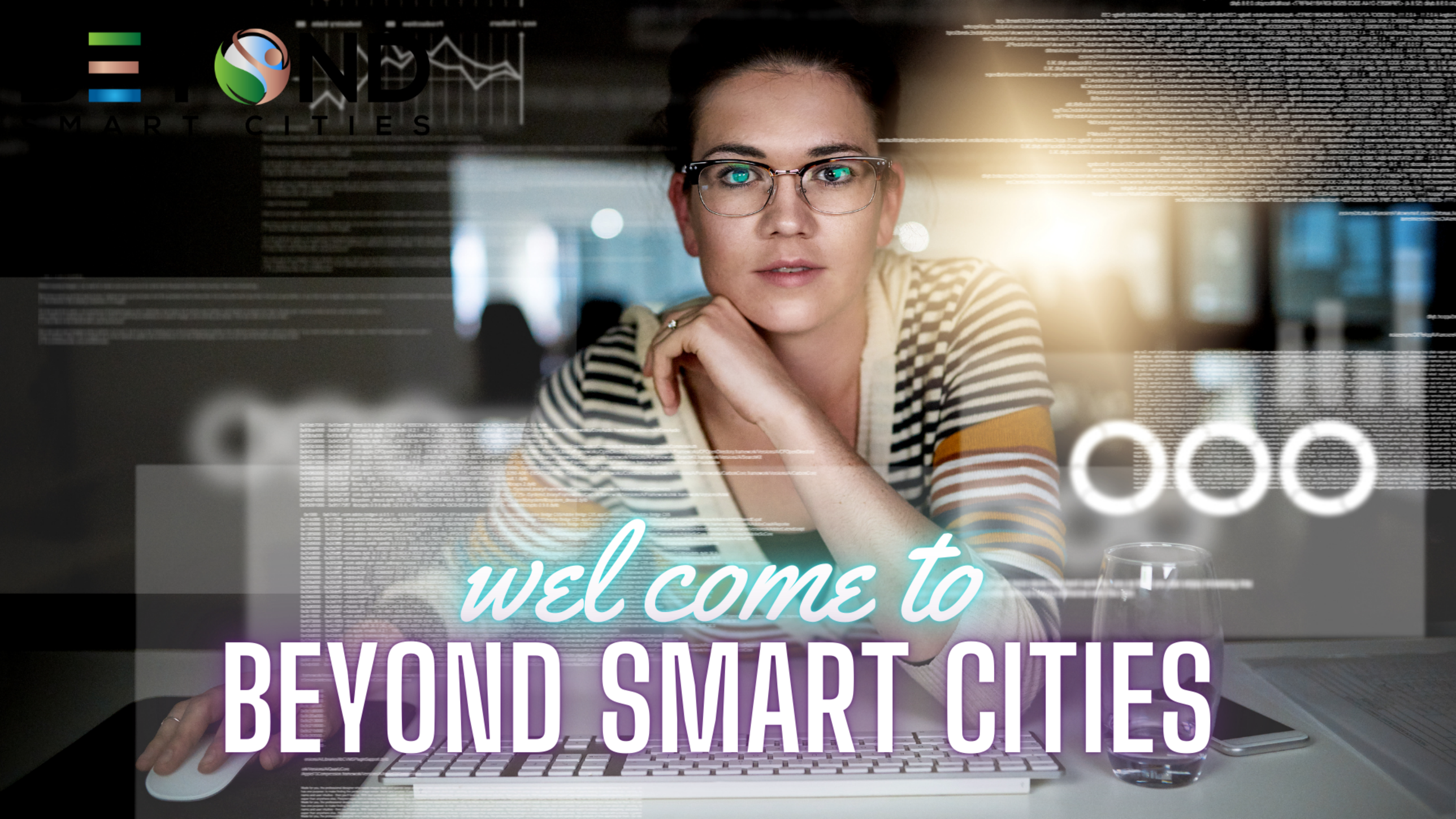
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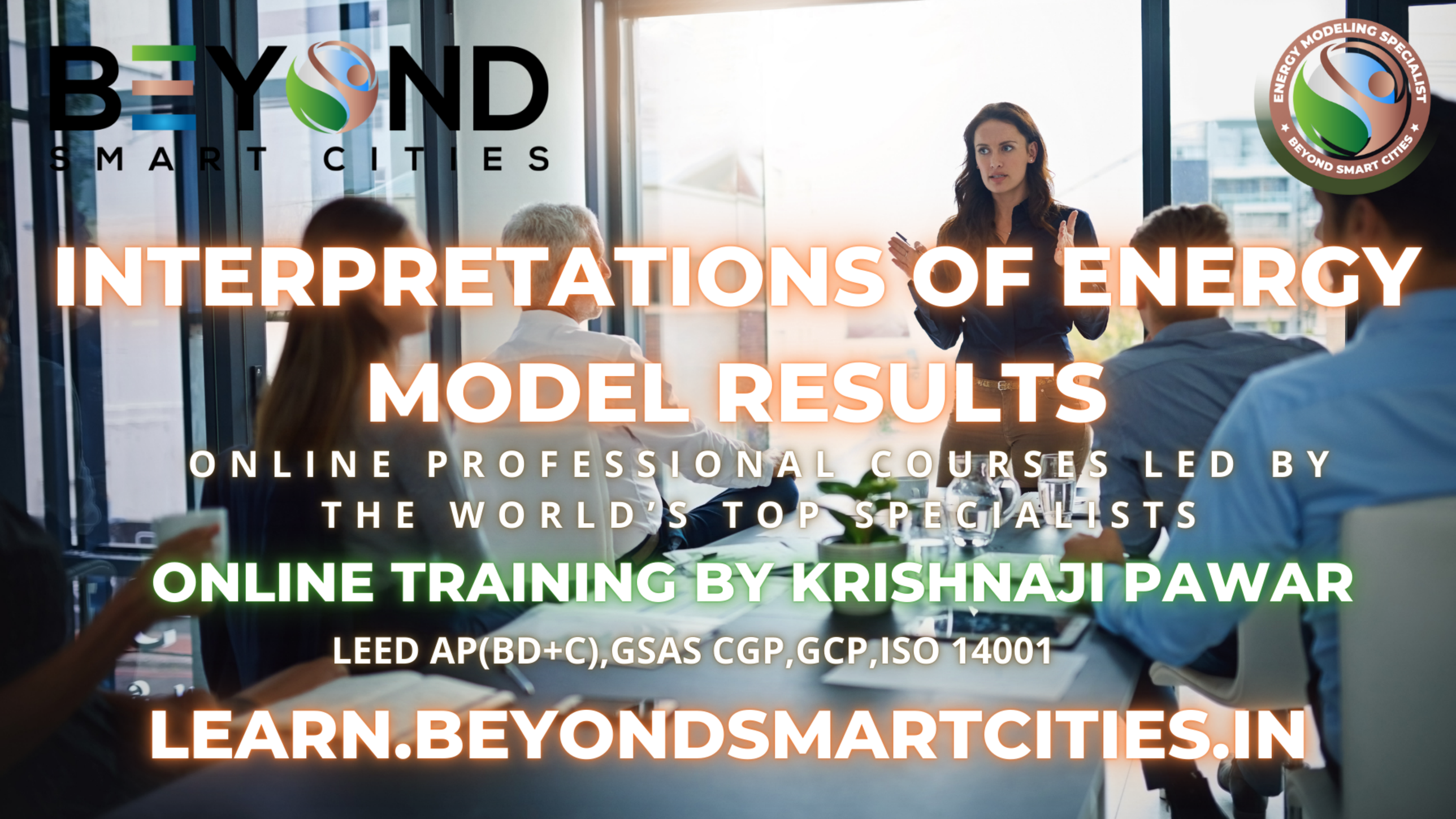
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MODULE L13

Exceptional Calculation Methods

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INTERPRETATIONS OF ENERGY MODEL RESULTS

BEM's exceptional calculation methods combine traditional engineering principles with advanced computational techniques, enabling architects to design energy-efficient and adaptable buildings that can withstand changing environmental conditions.

Learning Objectives

- Introduction and Course Outline
- Verification and Fixing of Simulation Results
- Analyzing and Comparing Modeling Results
- Economic Analysis
- Sensitivity Analysis
- Exceptional calculation methods
- Building Energy Modeling Project Deliverables
- Interpreting Model Results
- Sample Energy Modeling Report
- Summary and Resources
- BEMP Practice Test V.5.1

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INTRODUCTION

- Integrates principles from thermodynamics, fluid mechanics, and sustainability to optimize energy performance in buildings.
- As energy consumption in buildings contributes significantly to greenhouse gas emissions, accurate and efficient energy modeling techniques are crucial.
- Exceptional calculation methods include Dynamic Simulation Modeling (DSM), Computational Fluid Dynamics (CFD), Statistical Methods and Machine Learning, Life Cycle Assessment (LCA), and Model Predictive Control (MPC).
- SM simulates physical behavior of buildings over time, providing a nuanced understanding of energy performance.
- CFD provides insights into airflow patterns, temperature distribution, and pollutant dispersion, enabling architects to optimize shading devices and HVAC controls.
- Statistical methods and machine learning analyze historical energy usage data to predict future consumption.

BUILDING ENERGY MODELING: EXCEPTIONAL CALCULATION METHODS

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- Building Energy Modeling (BEM) is a crucial aspect of modern architecture and engineering.
- It integrates principles from thermodynamics, fluid mechanics, and sustainability to optimize energy performance in buildings.
- Energy consumption in buildings contributes significantly to global greenhouse gas emissions.

Fundamental Concepts in BEM

- Thermal Envelope: The building's outer shell that influences heat transfer.
- Internal Gains: Heat contributions from occupants, appliances, lighting, and processes.
- Heating, Ventilation, and Air Conditioning (HVAC) Systems: Systems designed to regulate indoor temperature, humidity, and air quality.
- Energy Sources: The various inputs that provide energy to a building.

EXCEPTIONAL CALCULATION METHODS IN BEM

- Dynamic Simulation Modeling (DSM): Simulates the physical behavior of buildings over time.
- Computational Fluid Dynamics (CFD): Simulates fluid flow and heat transfer within and around buildings.
- Statistical Methods and Machine Learning: Analyze historical energy usage data to identify patterns and predict future consumption.
- Life Cycle Assessment (LCA): Evaluates the environmental impacts of construction materials and building operations throughout their life cycle.
- Model Predictive Control (MPC): Utilizes a model of the building's energy systems to optimize HVAC operation dynamically.

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CONCLUSION

- Exceptional calculation methods in BEM represent a convergence of traditional engineering principles and advanced computational techniques.
- They contribute to achieving sustainable building practices and reducing global energy consumption and ecological footprint.

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THANK YOU